NON-PUBLIC?: N
ACCESSION #: 8801200197
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palo Verde Unit 3 PAGE: 1 of 4

DOCKET NUMBER: 05000530

TITLE: Reactor Trip Occurs Due To Control Element Assembly Subgroup Deviation
EVENT DATE: 12/17/87 LER #: 87-004-00 REPORT DATE: 01/15/88

OPERATING MODE: 1 POWER LEVEL: 050

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Timothy D. Shriver, Compliance Manager TELEPHONE #: 602-393-2521

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: AA COMPONENT: ZC MANUFACTURER: E146
REPORTABLE TO NPRDS: Y
CAUSE: B SYSTEM: AB COMPONENT: 94 MANUFACTURER: I005
REPORTABLE TO NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: At approximately 0430 MST on December 17, 1987, Palo Verde Unit 3 was in Mode 1 (POWER OPERATION) at approximately 50% power when a reactor (RX)
trip occurred as a result of a deviation in position occurring between Part Length Control Element Assembly (AA) subgroups. The trip occurred as the reactor was at the 50% test plateau during power ascension testing. The reactor trip was uncomplicated and the plant was stabilized within 30 minutes terminating the event. There were no Engineered Safety Features (JE) actuations.

The root cause of the trip was a malfunctioning Logic Sequencer Card (ZC) in the Control Element Drive Mechanism Control System (CEDMCS)(AA). As corrective action, the card was replaced and the CEDMCS was verified to be operating properly. Additional preventive corrective actions are being implemented as discussed in the text of this report.

Following the trip, a relay/contact (94/CNTR) assembly did not operate properly which resulted in the Class 1E pressurizer (PZR) heaters (EHTR)

continuing to remain energized below the low level trip setpoint. As corrective action, the relay/contact assembly was replaced and the heaters were verified to be operating properly.

No similar reactor trips have occurred.

(End of Abstract)

On December 17, 1987 at approximately 0430 MST, Palo Verde Unit 3 was in Mode 1 (POWER OPERATION) at approximately 50% reactor (RX) power when a reactor trip occurred due to a Low Departure from Nucleate Boiling Ratio (DNBR) trip signal. The DNBR trip signal was generated as the result of a deviation in position occurring between two Part Length Control Element Assembly (PLCEA)(AA) subgroups. The trip occurred during power ascension testing while the reactor was at the 50% test plateau. The reactor trip was uncomplicated and the plant was stabilized within 30 minutes terminating the event. No Engineered Safety Features (ESF)(JE) actuations occurred and none were required.

On December 17, 1987, Unit 3 was conducting power ascension testing per approved test procedures. Prior to the trip, testing was in progress for Control Element Assembly (CEA)(AA) shadowing factor/radial peaking factor verification. The test required that the Part Length Control Element Assemblies (PLCEA)(AA) be inserted while diluting the Reactor Coolant System (RCS)(AB) to maintain a relatively constant power level. At approximately 0427 MST with the PLCEA's partially inserted, a number of pre-trips and trips occurred on Channel "D" of the Core Protection Calculator (CPC)(JC). A reactor trip did not occur at this time since a reactor trip requires a two-of-four coincidence and no other channels tripped. The control room operator (utility, licensed) immediately stopped the PLCEA insertion and the trips and pre-trips in CPC Channel "D" reset. Additionally, the reactor operators terminated the dilution of the RCS and control room (NA) personnel proceeded to investigate the cause of the Channel "D" trip signals. Investigation by the control room operators, shift supervisor (utility, licensed), assistant shift supervisor (utility, licensed), and the reactor engineer (utility, non-licensed) acting as the Test Director could not identify an apparent indication which would explain the CPC Channel "D" trip and subsequent reset. Concurrently, although the dilution had been terminated, a reactivity change continued due to the effects of the dilution as there is a time delay between when the dilution is terminated and when equilibrium conditions exist. This resulted in the average RCS temperature continuing to rise. To stop the temperature rise, control room personnel had the choice of either adding boron to the RCS or continuing the PLCEA insertion. Due to the fact that there was no alarm condition indicating an

unacceptable subgroup deviation in the PLCEA's, it was decided to continue with the PLCEA insertion. Immediately following the initiation of the PLCEA insertion, the reactor tripped on low DNBR. The reactor trip was determined to be uncomplicated by the shift supervisor and the plant was stabilized within 30 minutes terminating the event.

Except as discussed below, there were no structures, systems, or components inoperable at the start of the event which contributed to the event. There were no automatic or manually initiated Engineered Safety Features (ESF)(JE) occurring during the event and none were necessary.

Subsequent investigation into the cause of the reactor trip identified that CPC Channels "A" and "D" had initiated trip signals due to a large penalty factor being applied to the calculated values of DNBR. The penalty factors were applied to the CPC calculation of DNBR due to a CEA subgroup deviation of greater than 7.5 inches. During the sequence of events described above, it is postulated that the CEA position-sensing reed switch (33) closed and re-opened momentarily as the PLCEA's were being inserted during the testing. Since PLCEA motion was stopped due to the CPC Channel "D" trip alarms, the reed switch remained opened allowing CPC "D" to reset. Following the determination to continue inserting PLCEA's in order to maintain temperature in the RCS, the reed switches monitoring CEA position closed in Channels "A" and "D" resulting in the large penalty factor insertion into the DNBR calculation for these channels. A review of plant conditions conducted after the trip identified that the subgroup deviation between the PLCEA's actually was greater than 7.5 inches. Therefore the Core Protection Calculator performed as designed and a reactor trip resulted. The PLCEA subgroup deviation for CPC Channels "B" and "C" were verified to be less than the 7.5 inch setpoint. Therefore Channels "B" and "C" operated as designed.

The root cause of this event was a malfunctioning Logic Sequence Card (ZC) in the Control Element Drive Mechanism Control System (CEDMCS)(AA). The malfunctioning card resulted in one PLCEA subgroup not consistently moving when required. This resulted in the subgroup deviation greater than 7.5 inches as discussed above. As corrective action to prevent recurrence, the Logic Sequencer Card has been replaced and CEA movement has been verified to be satisfactory. As additional corrective action, a root cause of failure analysis is being performed on the malfunctioning card.

Following the reactor trip, pressurizer (AB)(PZR) level decreased as expected; however, the class 1E pressurizer heater banks (EHTR) did not deenergize at 25% pressurizer level as required. Subsequent troubleshooting identified the root cause as a malfunctioning relay (94) and contact (CNTR) assembly in the heater control circuitry. As corrective action the relay/contact assembly has

been replaced and proper heater operation verified. Also, a root cause of failure will be performed on the relay/contact assembly.

Subsequent review determined that no heater damage has occurred. Review of plant performance data following the trip indicated that the lowest pressurizer level attained was 24%. Also, the heaters were deenergized by the reactor operator when the pressurizer level reached 24%. Since 24% pressurizer level is well above the top of the class 1E heaters, no heater damage was anticipated, and no damage has been indicated through subsequent operation.

An additional concern was identified since there is no alarm provided to warn control room personnel of an impending reactor trip due to subgroup deviations amongst the Part Length Control Element Assemblies (PLCEA). Based upon this concern, an engineering evaluation will be performed to evaluate a permanent change which would provide an alarm to control room personnel when subgroup deviations occur that may cause a reactor trip. Additionally, training will be conducted with control room personnel (utility, licensed) to reemphasize the fact that a reactor trip may result from excessive subgroup deviations. Furthermore, administrative controls will be established to ensure that PLCEA subgroup deviations do not increase until penalty factors are generated. These corrective actions will be applied to all three Palo Verde Units.

As described above, the reactor tripped as designed and all safety responses necessary to place the plant in a stable condition worked properly. There were no ESF actuations. Other than described above, there were no structures, systems, or components inoperable prior to the event which contributed to the event. There were no unusual characteristics of the work location that contributed to the event. Based upon the above, this event had no impact on the health and safety of the public.

No similar reactor trips have occurred.

MALFUNCTIONING COMPONENT INFORMATION:

Logic Sequencer Card

Manufacturer: Electro Mechanics, Incorporated
Model No.: 38311

Pressurizer Heater Contractor/Relay Assembly

Manufacturer: ITE Circuit Breaker, Ltd.

Model No.: J13PA4312

ATTACHMENT # 1 TO ANO # 8801200197 PAGE: 1 of 1

Arizona Nuclear Power Project
P.O. BOX 52034 PHOENIX, ARIZONA 85072-2034

192-00336-JGH/TDS/DAJ
January 15, 1988

NRC Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 3
Docket No. STN 50-530
Licensee Event Report 87-004-00
File: 88-020-404

Attached please find Licensee Event Report (LER) No. 87-004-00 prepared and submitted pursuant to 10CFR 50.73. In accordance with 10CFR 50.73(d), we are herewith forwarding a copy of the LER to the Regional Administrator of the Region V office.

If you have any questions, please contact T. D. Shriver, Compliance Manager at (602) 393-2521.

Very truly yours,
/s/ J. G. Haynes
J. G. Haynes
Vice President
Nuclear Production

JGH/TDS/DAJ/kj
Attachment
cc: O. M. DeMichele (all w/a)
E. E. Van Brunt, Jr.
J. B. Martin
J. R. Ball
R. C. Sorenson
E. A. Licitra
A. C. Gehr
INPO Records Center

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